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The JOURNAL of GEOGRAPHY

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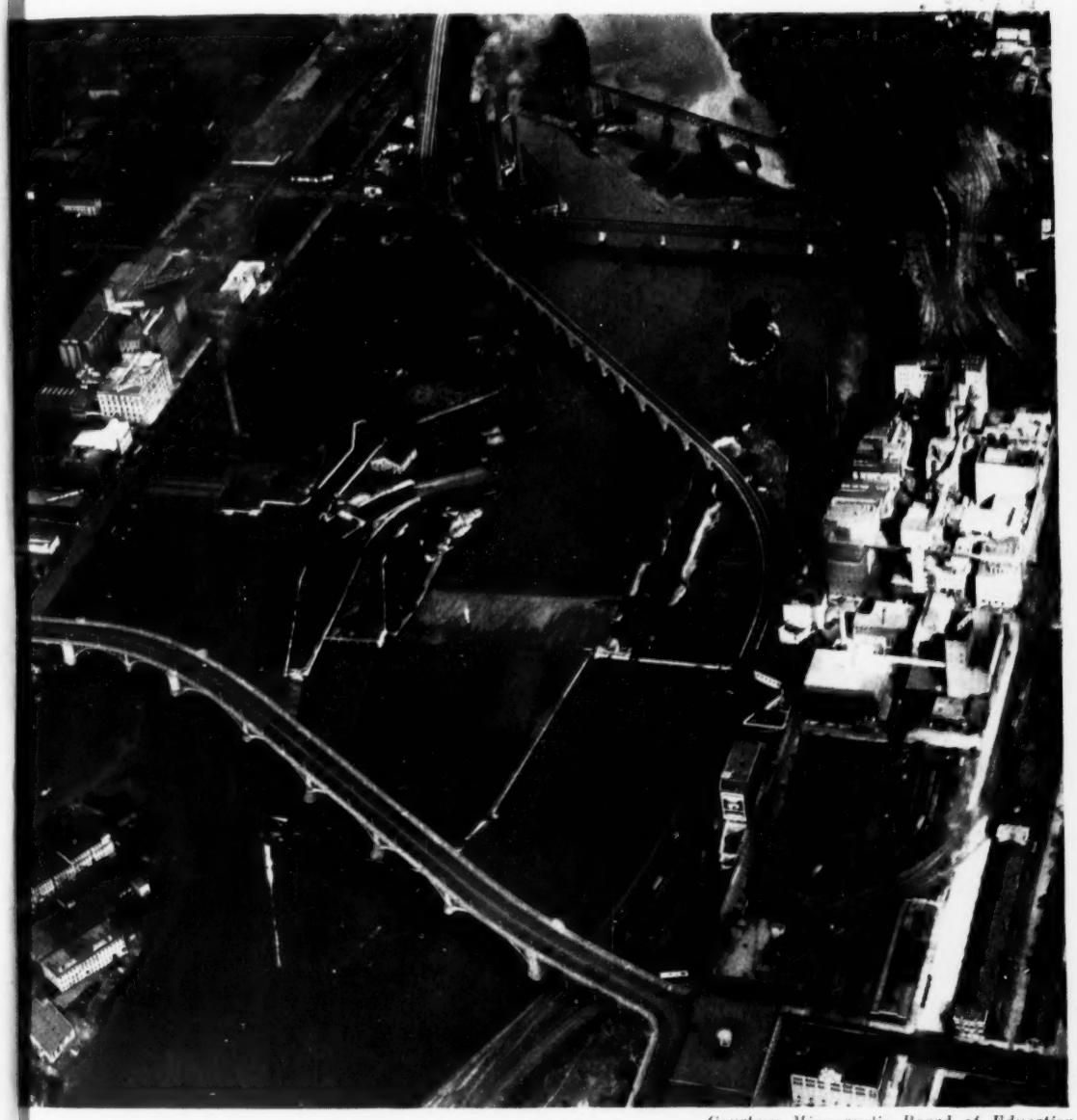

Courtesy Minneapolis Board of Education

A view of the famous St. Anthony Falls and the flour milling district of Minneapolis

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GEORGE J. MILLER, *Editor and Secretary*

The JOURNAL *of* GEOGRAPHY

A MAGAZINE FOR SCHOOLS

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This is the fifth article in our industrial series. Dr. Trewartha is Assistant Professor of Geography in the University of Wisconsin, and was a John Simon Guggenheim Fellow for Geographical Research in the Far East of 1926-27. Dr. Trewartha's special field of teaching and research is the Far East, and Climatology. A more extensive discussion of tea within a limited area appears under the title of "A Geographic Study in Shizuokà Prefecture, Japan," in the *Annals of the Association of American Geographers*, Vol. 18, Sept. 1928. These two articles will give the teacher a splendid body of material for teaching purposes and will be equally fine sources of information for the student.

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VOLUME XXVIII JANUARY, 1929 NUMBER 1

THE TEA CROP

GLENN T. TREWARTHA*
University of Wisconsin

THE TEA ENVIRONMENT

The tea plant is native to the hill lands and mountains of monsoonal Asia and it is along the eastern and southern margins of that continent that almost the entire tea crop of the world is grown today. Very minor areas planted to tea exist in southern Russia and in eastern and southeastern Africa (Nyasaland, Natal Kenya and Uganda) but they are only able to supply limited local needs. This almost complete concentration of commercial tea production in the monsoon lands of Asia is related to; (1) the indigenous nature of the plant in the region, (2) the satisfactory and even favorable conditions of physical environment, particularly climatic, which prevail over large areas, and (3) the abundance of cheap unskilled labor which is available. The last item is the most critical and it, more than the others, has been responsible for causing the commercial production of tea to remain in the Orient, for while satisfactory natural conditions for the tea plant are not difficult to find in other parts of the world, the labor requirement can scarcely be met elsewhere.

Climatically tea belongs to the humid tropics and sub-tropics where high temperatures, long growing season, and heavy rainfall well distributed, make for a rich, continuous, and rapid growth of new and tender shoots. Thus in southern India, Ceylon and the Dutch East Indies there is no dormant season for the tea bush and picking continues thruout the entire year. Commercial tea production extends poleward to the 38° parallel in Japan and to the 35th in China but at the expense of fewer pickings and smaller yields, associated with more severe temperatures, shorter growing season and decreased precipitation. The atmospheric conditions

* John Simon Guggenheim Fellow for Geographic Research in the Far East, 1926-1927.

which make for the most abundant leaf yield however, do not at the same time develop the highest quality leaves, for it is a proven fact that in the wet tropics the finest teas are from high-altitude gardens, and plucked at those seasons when decreased rainfall has resulted in slower leaf growth.

Tea is grown on a wide variety of soils and slopes. It thrives best however in light friable loams with porous subsoils, which combination allows the maximum development of the plant's tap root and at the same time permits a free percolation of water, for tea is highly intolerant of stagnant water both in the soil and in the subsoil. Soils rich in organic matter are particularly satisfactory for tea, while a number of authorities suggest, altho not too emphatically, that a high iron content is likewise desirable. In Japan a large part of the tea crop is grown on rust-colored, volcanic-ash soils, high in both iron and humus and it is significant also that the most common fertilizer applied to the soil of the tea gardens is bean cake, a nitrogenous manure. It is recognized by tea men that soil differences are of paramount significance in creating contrasts in flavor, aroma, and color in teas from various districts having similar climatic characteristics.

The somewhat contradictory requirement of heavy precipitation and at the same time well drained soils and subsoils, has led in many regions to the adoption of slopes as sites for tea gardens. In such locations tea hedges planted at right angles to the slope tend to anchor the soil and prevent rapid and destructive slope wash. The factor of crop competition no doubt likewise plays a part in the adoption of slope sites for tea, for in the densely populated lands of southeastern Asia, the overcrowded lowlands where irrigation is possible are almost exclusively devoted to rice and other more minor food crops so that tea is frequently relegated to the less easily accessible and also less productive slopes. This may be at the expense of decreasing the yield however, for the thin soils of the steep slopes, besides being deficient in quantity of plant food, do not allow the maximum development of the plant's root system. Undulating, well-watered tracts, where the water escapes freely without serious soil wash, represent the optimum conditions.

VARIETIES AND CLASSES OF TEA

At least two distinct varieties of tea are recognized at the present time, the large leaved Assam types and the small leaved Chi-

nese varieties. These two and their hybrids furnish the teas of commerce. The Chinese variety is a small bush, which is hardy and capable of thriving under more severe climatic conditions than is the more prolific Assam type. The former is the commercial plant of Japan, China, and the earlier estates of India. The Assam variety is much larger, attaining tree dimensions if unpruned, with leaves 4 to 9 inches in length. It is tender and difficult to cultivate requiring a hot, moist and equable climate. It covers the greatest areas of all the more modern plantings in India, Ceylon and the Dutch East Indies.

But altho there are these two distinct varieties of the tea plant, the quality, aroma and flavor of the prepared leaf are dependent upon the methods of manufacture rather than upon the variety of the tea bush from which it originated. Two large classes of processed tea are recognized, known to the trade as green and black, the former being largely a product of Japanese and Chinese factories, while India, Ceylon and the Dutch East Indies are almost exclusively manufacturers of black tea, with China a large producer of black as well as green. In the manufacture of black tea the raw leaf, after being plucked, is allowed to wither and ferment for a definite period of time before it is fired and rolled, while in the processing of green tea the raw leaves are subjected to a period of great heat immediately after being plucked in order to completely prevent any fermentation from taking place, so that the leaf will retain its original color and flavor. Formosan oolongs are semi-fermented teas, the period of withering being considerably less than is required in the manufacture of black tea.

World Production and Consumption

Reliable figures for tea acreage and production are not available for China yet there is no doubt but what that country is the largest producer as well as the largest consumer of tea.

TABLE I. *Tea Acreage*[1]

	Acres
China	unknown
India	708,000
Ceylon	420,000
Dutch East Indies	235,000
Japan	115,000
Formosa	88,710

[1] "The World Production of Tea" in *The Tea and Coffee Trade Journal*, Vol. 46, No. 4, April, 1924, pp. 483-492.

But while China's enormous crop is largely consumed at home by her large tea-drinking population, as is also true of Japan, altho to a less extent, the tea of India, Ceylon and the Dutch East Indies is almost entirely an export crop since the natives of these lands are not tea drinkers. The predominance of British India, Ceylon, the Dutch East Indies and China,[2] all of them, with the exception of China, almost exclusively producers of black tea, assures that product of a much higher rank in world trade than its competitors, green and oolong teas. (See Table II). Black tea certainly makes up more than 85 per cent of the total world export.

TABLE II. *Export of Tea, 1926*[3]

	Pounds
British India	350,909,000
Ceylon	217,184,000
Dutch East Indies	120,184,000
China	109,129,000
Japan	23,965,000
Formosa	22,926,000

If a map were to be made showing by intensity of shading the per capita consumption of tea, the British Isles would appear as the darkest spot on the map. Second to the British Isles are some of its colonies and outlying possessions to which have been carried the British tastes and customs, while following them come the original tea drinkers, Japan and China.[4] Of all the tea exported, the United Kingdom takes nearly 50 per cent, nine-tenths of it originating within its own dominions. A portion of this is reshipped. Next in rank as importers after the United Kingdom, but far below, are the United States, Russia, Australia, and Canada. All of the world markets, with the exception of the United States, and to a lesser degree Canada, are importers of black teas, almost exclusively, and the American market is likewise trending in that direction, for while in 1923 our purchases of black, green, and oolong teas were 52, 35, and 13 per cents respectively,[5] for the fiscal year ended June 30, 1928, they were

[2] China's exports of black tea and green tea are usually in the ratio of 2 or 3 to 1.

[3] Year Book of Agriculture, 1927, United States Department of Agriculture, p. 1186.

[4] "The World Consumption of Tea," in *The Tea and Coffee Trade Journal*, Vol. 46, No. 5, May, 1924, pp. 627-634. (627).

[5] *Ibid.*, p. 630.

60.5, 28 and 11.5.[6] Prior to the World War Russia imported more tea than any other country excepting The United Kingdom, in 1914 its purchases amounting to 172,550,000 pounds.[7] Most of this came overland by caravan and Siberian railway from China.

TABLE III. *Tea Imports, 1926*[8]

	Pounds
United Kingdom	410,986,000
United States	95,930,000
Russia	48,627,000
Australia	46,949,000
Canada	37,630,000

REGIONAL DISTRIBUTION OF THE TEA CROP

India

India has two large, distinct and far separated regions of tea cultivation, the much larger of the two being in northeastern India in the provinces of Assam and Bengal, while the smaller center, with only one-sixth the acreage, is in extreme southwestern India

TABLE IV. *Distribution of Tea Acreage in India*[9]

	Acres	*Total Acres*
Assam		412,500
Cachar, Surma Valley	58,000	
Sylhet, Surma Valley	87,000	
Darrang, Brahmaputra Valley	56,000	
Sibsagar, Brahmaputra Valley	99,000	
Lakhimpur, Brahmaputra Valley	94,000	
Not accounted for	18,500	
Bengal		185,400
The Duars (Dooars)	115,400	
Darjeeling	46,000	
The Terai	19,000	
Chittagong	5,000	
Southern India		91,900
Northern India		15,800
Bihar and Orissa		2,100
Total		707,700

[6] "Domestic Commerce," United States Department of Commerce, Vol. 2, No. 26, Sept. 3, 1928, p. 6.

[7] The Worlds' Consumption of Tea, op. cit. p. 634.

[8] Year Book of Agriculture 1927, op. cit. p. 1186.

[9] William H. Ukers, "A Little Journey to India," in *The Tea and Coffee Trade Journal*, Vol. 48, No. 6, June, 1925, pp. 771-792 (786 and 787).

on the western slopes of the Cardamon, Anaimali and Nilgiri Hills, all of them being parts of the Western Ghats. Besides these two more outstanding regions of tea cultivation there are small areas in the hill country of Bihar and Orissa and others in the Himalaya foothills of United Provinces and Punjab (See Fig. 1).

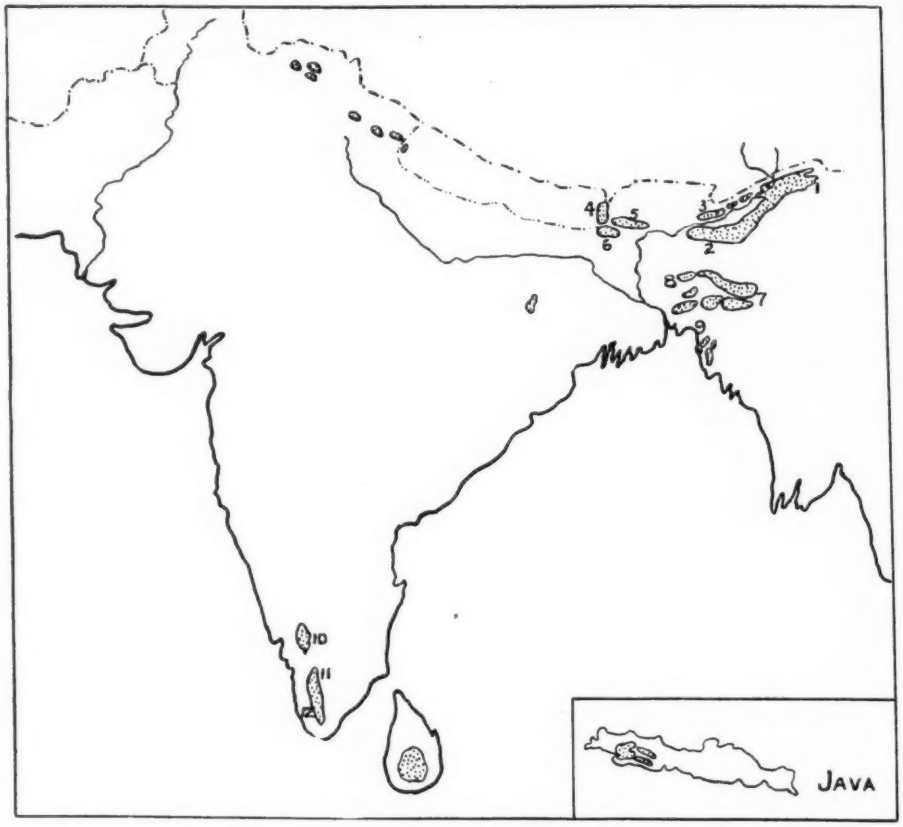

FIG. 1. Tea areas in India, Ceylon, and Java. 1 Lakhimpur District; 2 Sibsagar; 3 Darrang; 4 Darjeeling; 5 Duars (Dooars); 6 Terai; 7 Cachar; 8 Sylhet; 9 Chittagong; 10 Nilgiri Hills; 11 Anaimali Hills; 12 Cardamon Hills. In Ceylon tea is concentrated in the hill lands and mountains of the south central part of the island. Tea estates in Java are largely concentrated in a volcanic mountain range in the Preanger Residency.

SOUTHERN INDIA. The tea area in southwestern peninsular India receives heavy rainfall from the western or Arabian Sea branch of the Indian Monsoon, which after flowing for thousands of miles over warm tropical seas, impinges at almost right angles upon the precipitous Ghats, resulting in very heavy rainfall of 100

to 150 inches. While much the larger part of this falls during the summer monsoon, the rest of the year is not rainless, the region being close enough to the equator (9° - 12° N.) so that its dry season is reduced to three months. The continuously high temperatures of these low latitudes (Calicut has a range of 7° F.), plus the very abundant precipitation, well distributed for a monsoon country, are an advantage, for the tea bush knows no dormant period but continues to flush thruout the entire year. As in Ceylon, which is only slightly nearer the equator, picking goes on continuously the whole year thru at intervals of 7 to 14 days, frequency depending somewhat upon the elevation of the gardens. This is a distinct advantage over northern India which has a cool season of three or four months when leaf growth practically ceases and no pickings occur.

As is normal on slope sites in regions of very heavy precipitation, slopewash and gulleying are relatively serious problems on the tea estates of southern India. Crude terracing is resorted to on some estates; trenching the hillsides at right angles to the slope, the planting of cover crops between the tea hedges and the construction of drainage systems are other methods used in the struggle to retain the soil mantle.

From a study of some of the detailed relief maps (scale 1 inch = 2 miles) of southwestern India it appears that the tea estates are not located upon the very steep western escarpment of the Ghats, but rather upon the less steeply inclined slopes of the dissected tableland just back of the escarpment. Some of the tea gardens are in headwaters of drainage basins whose rivers flow toward the east into the Bay of Bengal. They are not however far enough east to be under the influence of a distinct rain shadow.

The tea from southern India is not, on the whole, of as fine quality as that from the northeastern district, the bulk of it being of a thick, soft character, with a grade of common to medium. Some of the high-grown teas in the Nilgiri Hills, however, are above the average for the whole region and scarcely can be distinguished from the better Ceylons.

NORTHEASTERN INDIA. In northeastern India there are several distinct centers and even sub-centers of tea production. Assam province which has the largest acreage possesses two large regions of concentration, namely the Brahmaputra Basin and Surma Basin, these being separated by the Garo and Khasi Hills. The basin of the Brahmaputra boasts of being the worlds greatest tea

district, with 268,000 acres planted to that bush, this area divided among 586 estates. The tea plantations are largely in the upper part of the valley, the major centers being the Lakhimpur district around Dibrugarh, which produces the finest teas of Assam; the Sibsagar district around Jorhat and the Darrang district farther down stream and on the north side of the river, with Tezpuro near its center.[10] The tea estates are almost exclusively at low altitudes, although they are not immediately adjacent to the river. In most cases they occupy rolling or even flat lands although some plantations still flourish on the lower slopes of the adjacent hill lands. During the early period of tea planting in northeastern India, hill sites were frequently chosen for tea estates, possibly reflecting the use of slope lands for tea in China, or the superiority of the hills may have been suggested through the discovery of wild tea growing on slopes, this being taken as a sign that such locations were particularily suitable for tea growth. In a region of very heavy rainfall such as this is however,[10a] the problem of soil erosion became so serious on the cleared slopes that many of the earlier hill plantations were abandoned and later planting has been almost exclusively in the lowlands. More recently tea gardens have been developed in large numbers upon what are termed "bheels" (swamps), lands resembling the peat bogs of Ireland. Elaborate systems of drainage have been necessary in order to prepare these lands but they have the capacity of producing enormous yields of leaf. Ukers describes the region around Jorhat as follows: "Great sheets of tea meet the eye on every side as one journeys through the Sibsagar district. The roads are only fair and must be very trying during the rains. The country is flat and the vast expanses of tea, unrelieved save by the grivilleas, which provide a kind of lacework shade canopy, suggest the coffee country of Sao Paulo. In Ceylon there is much variety of vegetation; here only tea or rice and tea meet the eye."[11]

In Assam the tea bushes are picked regularly every 8 or 9 days at low elevations and somewhat less frequently at high altitudes.

[10] Very detailed sketch map showing tea areas of Northeastern India accompanies an article, "Tea in North-East India" by P. H. Carpenter, in *The Agricultural Journal of India*, Vol. XXII, Part 1, Jan., 1928, pp. 5-15.

[10a] Sibsagar in the Brahmaputra lowlands in the heart of a famous tea district, has a rainfall of 94 inches.

[11] Ukers, "A Little Journey to India," op. cit. p. 786.

The bushes are first tipped in March or April but the first real flush occurs in May and the second in June. The high yields occur in July, August, and September, with October yielding a fair amount while November provides one or two good pickings if the rains hold out. From December until the spring tipping no further pluckings occur.[12] There is an old saying in Calcutta that all factories should be clear of tea on Christmas Day to start work again about the following April. In one sense this is an advantage for it gives the manager and his staff an opportunity to attend to pruning, field cultivation, overhauling machinery, etc., but at the same time there is a reduced yield as the result of the dormant period. In Java, where picking continues thruout the year, the leaf yield per unit area is somewhat greater than it is in northern India.

Picking is mostly done by female coolies. If very delicate quality tea is required only the bud and two youngest leaves are plucked but if the quanity of yield is of chief significance three or four leaves may be taken.

Outlet for the tea product from the Brahmaputra Valley is both by rail and by river thru the port of Calcutta. Up until the beginning of the present century the main artery of Assam was the Brahmaputra and even at the present time a service of paddle steamers plies between Calcutta and Dibrugarh, a distance of about 1000 miles, which is covered in a fortnight. Light gauge railways connect the tea gardens with the river. The districts to the north of the river must still depend upon the steamers as far at Gauhati. The Aaaam-Gengal Railway to the south of the Brahmaputra passes thru the heart of the main tea districts, with several spur and feeder lines tapping the more distant centers. Automobile trucks are now being used extensively for local tea transport but the Brahmaputra Valley is particularly unfortunate so far as roads are concerned, because very little suitable road-building material is available on the south side of the stream where most of the tea gardens are situated. The roads are therefore of earth and unsurfaced so that they are thick with dust or mud depending upon the season. During the height of the moonsoon rains many places are isolated except for ox-cart traffic.[13]

The Cachar and Sylhet tea districts located in the Surma Basin

[12] Quoted by Ukers, Ibid, p. 788.

[13] Carpenter, op. cit., p. 11.

south of The Garo and Khasi Hills, together represent the second largest tea center in India. Here, as in the Brahmaputra Basin, the tea estates are to be found on the lowlands, some of them on lands which were previously swamps, as well as on the lower slopes of the adjacent hills, particularly those to the south. Both rail and river transport are available to the tea estates, small country boats serving to bring the tea cargo down to the main stream where it is transferred to large steamers. The Surma Valley has direct rail connections with the port of Chittagong but not with Calcutta, hence the former is more generally utilized by the region. Wagon roads are somewhat better in the Surma Valley than in the Brahmaputra, partly because of more available road building material and partly also due to the greater use of small boats for local transport, thus reducing the amount of traffic on the roads.

The Chittagong tea district in Bengal, near the port of Chittagong, is relatively small and unimportant. It does not have an entirely satisfactory climate for tea and so has not developed to any great extent. The much larger and more significant tea areas in Bengal are: (1) Darjeeling, (2) The Duars (known as Jalpaiguri), and (3) The Terai. The two latter districts are parts of the low lying jungle-covered plains, containing some hills, just at the base of The Himalayas. Tea occupies both the plains and the hills, some of the estates reaching elevations of 1000 to 2000 feet. In the vicinity of Darjeeling, the famous hill station of Calcutta at an elevation of about 7000 feet in the Sub-Himalayas, are grown the finest teas of India. These are the only high-altitude estates in northern India, the tea here growing up to elevations of 6000 feet, altho the concentration is at 3000 to 4000 feet. The rainfall is very heavy (123 inches at Darjeeling) and this together with the slope locations of the tea estates makes terracing compulsory. Temperatures are relatively low as tea climates go (61.5° F. for July at Darjeeling) but the high altitude environment seems to develop a flavor in the teas grown there which does not have an equal anywhere. Quantity is sacrificed for quality however, for the production of leaf per unit of area is relatively small, approximately half that of tea estates in the upper Brahmaputra Valley.

Each of the tea districts in India has individuality in the quality of its product. The quality and flavor of the Darjeeling teas are

TABLE V. *Yields of Tea From Various Districts in 1924*[14]

	Pounds per acre
Lakhimpur (Brahmaputra)	752
Sibsagar (Brahmaputra)	614
Darrang (Brahamputra)	576
The Duars (or Dooars)	588
Darjeeling	330

distinctive, the peculiar aroma being muscatel or black currant.[15] The slow growth of the leaf seems to have much to do with its quality and usually the slower the growth the finer the flavor. It has been noted in Darjeeling that some of the finest teas are produced at times when the green fly attacks the plant and the growth of leaf is checked.[16] Northern Assam teas are flavory, strong and pungent and at certain periods of the year they are known for quality as well. On the whole they rank next to Darjeeling teas in quality, followed in turn by those from The Duars and then by Cachar and Sylhet. In Assam there are two quality periods, the first with the second real flush which occurs in June, "When all of the qualities are fully developed and there is an abundance of 'tip.'" During the height of the monsoon when leaf growth is most rapid and abundant there is a general falling off in the quality of tea all over northern India but with the first hint of autumn coolness quality appears again and this is followed by autumn flavor.[17] The Duars teas are noted for their smoothness and thickness, while the cool-weather flavor has some Darjeeling characteristics. They are largely in demand by blenders. Cachar and Sylhet teas are mostly common to medium in grade but are very useful for thickness and in giving a tippy appearance at a medium price.[18]

Tea growing in India is done on a large scale on estates of 1000 to 2000 acres owned by companies, and under the supervision of highly paid expert managers. The planters and managers live with their families on the frequently isolated and lonely estates, the white population from the countryside endeavoring to get together once a week or so at The Club for dinner and a variety of sports. Each estate is a self sufficient community, with its native village where the coolie laborers dwell, its hospital, school, tea

[14] Carpenter, Ibid, p. 15.

[15] "India's Tea Industry" in *The Tea and Coffee Trade Journal*, Vol. 68, No. 6, June, 1925, pp. 793-802 (p. 801)—quoting Mr. J. C. Coke, London Tea Expert.

[16] Ibid, p. 793.

[17] Ukers, op. cit. p. 788, quoting Mr. C. R. Harler.

[18] "India's Tea Industry," op. cit. p. 802, quoting Mr. J. C. Coke.

factory, and homes for the white managerial staff. The total area in northeastern India occupied by tea planters is 2,000,133 acres of which area 594,692 acres are in tea. The number of estates is 1,233 which gives them an average size of 1,622 acres of tea to

FIG. 2. The tea plantations of Ceylon for the most part occupy slope sites. Note the railroad winding its way up the steep slope. Copyright by Underwood and Underwood.

each estate.[19] Forest lands which are utilized for their wood, grazing areas, and tilled land in food crops, ordinarily occupy a large proportion of the land on each estate.

Ceylon

Ceylon, after India, is the greatest exporter of tea, and like India, it specializes almost exclusively in black tea. In the matter of large estates it likewise duplicates its northern neighbor but on account of its less abundant labor supply, annual importations

[19] P. H. Carpenter, Tea Production in North-East India in *The Tea and Coffee Trade Journal*, Vol. 54, No. 5, May, 1928, pp. 627-634 (633)

of coolies from India are necessary. Ceylon's more tropical climate with no distinct cool season, and rainfall thruout the year, allows the tea bush to produce leaves during the whole twelve months which is in contrast to the situation in northern India.

Ceylon's rise as a tea producing region dates from about 1880, the industry having its inception in the disaster which the coffee blight spread among the coffee plantations of the island during the 60's and 70's. Some of the more enterprising coffee planters turned to tea as a substitute crop and after numerous discouragements their efforts were successful. Today tea is Ceylon's chief economic interest.

The tea estates, covering an area of 420,000 acres, are almost exclusively concentrated in the mountain and broken hill country of south central Ceylon which is the core and hub of the somewhat assymetrical island. Being an island, and with winds from tropical seas at all times of the year, Ceylon, and more especially its mountain province, is assured of heavy precipitation both during the winter and the summer monsoons, so that the tea districts receive 100 to 200 inches of precipitation well distributed thruout the year. Kandy at about 1,600 feet elevation receives 85 inches of rain with only two months having less than four inches. The yearly temperature thruout the tea area varies from 60° to 75° depending upon altitude, with the difference between the means of the warmest and coldest months averaging approximately 5°F. The actual temperatures therefore are not uncomfortable, but the monotony of the climate as well as the long periods of incessant rain and mist make the tea country a not too pleasant place in which to live.

In Ceylon, as contrasted with India, tea is a dweller on hillsides and mountain slopes. "Often the rows of tea shrubs cover inclines so steep that it is difficult to see how they can be tended; but the barefoot coolies seem to have no trouble in keeping a foothold where a shoe-shod white man would probably slide into a fall of hundreds of feet."[20] Such sites require careful terracing, and well developed drainage systems to prevent serious soil loss by slopewash and gulleying. In the lower hill country tea is by no means the exclusive form of culture, patches of cacao, rubber, cardamons, irrigated rice and other food crops being plentiful. But with increasing elevation tea tends more and more to monop-

[20] The World's Production of Tea, op. cit. p. 489.

olize the cultivated areas. "The country to be seen on a railway journey from Kandy to Nanu Oya indicates very forcibly the extent of this, the premier industry of Ceylon. Whole stretches of the countryside are covered without a break with close even rows of carefully tended tea bushes, the boundaries between various properties being unmarked. The monotony of the same cultivation is relieved by the hilly nature of the country, the lines of shade trees and wind belts and with an occasional glimpse of a bungalow sheltering in a clump of garden trees, estate buildings, coolie lines and large three or four storied factories significant of the industry of the surroundings. Visitors usually remark on the steepness of some of the tea fields which appear from a distance, to rise almost vertically up the side of the far hills, crowned with thick jungle and overhanging rocks."[21]

Tea grows from almost sea level up to 7,000 feet but the concentration of estates is at an elevation of about 3,000 feet. There is a marked contrast in quality and quantity of the product at various elevations and at various local sites. The same general rule holds here as in India, that the low grown teas are strong and without distinctive flavor, this lack of quality being compensated for somewhat however by the larger yields. The high-grown teas, where the growth of leaf is slower and there has been time for the fuller development of the flavoring constituents, are noted for their good quality and flavor. During the months when the growth of foliage is most active, namely from March to May and again to a lesser extent in October and November, quality decreases even in the highest estates and returns again in the seasons when growth is less rapid. In the Uva district a few days of dry windy weather will cause a marked increase in the quality of the leaf. The same effect is produced in the high altitudes in January and February when bright sunny days followed by cool nights, frequently with frost, are more common.[22]

The Dutch East Indies

The Dutch East Indies are third in rank among the tea exporting regions, their trade being in black tea almost exclusively.

[21] C. F. Whitaker, "The Tea Industry" in Ceylon, Its History, People, Commerce and Resources, Colombo, Ceylon, 1924, reprinted from The Ceylon Handbook, 1924, p. 4.

[22] "Ceylon Tea in 1923-24" in *The Tea and Coffee Trade Journal*, Vol. 48, No. 5, May, 1925, pp. 623-633 (p. 625). See also William H. Ukers, Touring Ceylon's Tea Estates, Ibid, pp. 612-623.

Only in recent years have East Indian teas been an important factor in the world's tea market, but at the present time their exports are increasing at a more rapid rate than is true for either India or Ceylon. In 1925 there were 194,439 acres of tea in Java and 26,621 acres in Sumatra.[23] It is likely that only in the latter island will a large future expansion take place, the land suitable for tea in Java having been already largely occupied.

Java tea is a slope crop grown for the most part in the volcanic mountain range of western Java in the Preanger Residency. This concentration of tea estates in the high-lying districts of western Java, according to Reynst, is related to the heavier rainfall there as compared with other parts of the island and likewise to the greater density of population in the Sudanese districts of West Java.[24] On the slopes of two extinct volcanoes, Gedek and Salak, there is a marked concentration of fine tea estates, producing some of the highest quality tea of the island. The soils are dark colored, deep friable loams into some of which a stick can be thrust for 18 inches or more.[25] The lay of the land is usually excellent affording splendid drainage. The lands in tea range from 800 to 5,000 feet in elevation with the greatest concentration between 1,500 and 3,500 feet. Rainfall is unusually heavy in the tea districts, averaging 150 to 200 inches, and well distributed seasonally. Being not more than 6° to 7° south of the equator temperatures even at moderate altitudes are relatively high (65° to 75° average for the year) with mean annual ranges of only two or three degrees. Picking is therefore continuous thruout the year. Because of the very heavy precipitation terracing and trenching are necessary on the tea estates to prevent destructive soil wash.

Java is not famous for its quality teas, producing nothing equal to the fine Darjeeling teas or those from the Upper Brahmaputra Valley. This lack of quality is reflected in the London market prices, where East Indian tea is quoted at a lower figure than that from India or Ceylon. This somewhat medium quality of the Java product is partly attributed to the relatively large amount of tea produced on small patches by the natives. Large

[23] C. H. Harler, A Visit to the Tea Districts of Java in *The Tea and Coffee Trade Journal*, Vol. 55, No. 2. Aug., 1928, p. 147-156 (150).

[24] A. E. Reynst, "Java and Sumatra Tea Estates" in *Tropical Agriculture*, March, 1926, Vol. 2, No. 12, pp. 58-59.

[25] "Java: Its Life and Its Tea" in *The Tea and Coffee Trade Journal*, Vol. 45, No. 2, Aug., 1923, pp. 197-200 and Vol. 45, No. 3, Sept., 1923, pp. 356-358.

estates, scientifically managed are the rule, to be sure, but about 50,000 to 60,000 acres are in small native tea gardens bordering the villages. These gardens are usually poorly cultivated and poorly picked so that the fresh leaves, which are usually sold to factories on the neighboring European-owned estates, are not of good quality.[26] As in other tea areas in the tropics, the quality teas of Java are produced when the rains are least and the flush is relatively small, this occurring in July, August and September.

Sumatra is still in its infancy as a tea producer but the amount of good available tea land which is still unutilized causes tea men to forecast that this island is due for a remarkable expansion of its tea area. The largest and most rapidly growing district at the present time is on the Saintar Plateau in Northeastern Java where the tea estates lie at elevations of 1,200 to 2,400 feet and higher.

China

Because of its stupendous domestic market China is still the world leader in tea acreage and production altho it has declined from first to fourth position in tea exports, this being an absolute as well as a relative slump. In 1820 tea formed three fourths of the entire export trade of China; as late as 1871 China covered with its tea export 86 per cent of the world's demand. But by 1901 this percentage was only 25 per cent[27] and in 1926, 13 per cent. It reached its maximum export in 1886 when 300,000,000 pounds were taken, but from that time on the competition of India and Ceylon came to be more severely felt. China's leadership in world export of tea passed to India in 1904; it was passed by Ceylon in 1916 and by The Dutch East Indies in 1918.[28]

Tea growing in China is done in a most haphazard sort of way. Estates as they exist in India, Ceylon and Java, with their scientific management and supervision are unknown in China. Here tea growing is a family industry. The tea gardens are usually small patches of land on the south side of a hill, cared for by the farmer and his family during their spare time. In their eagerness to get large immediate returns bushes are frequently

[26] William H. Ukers, "A Little Journey to Insulindie," Part II, "A Visit to Java, the Garden of the East." *The Tea and Coffee Trade Journal*, Vol. 49, No. 2, pp. 227-361 (p. 253).

[27] Boris, P. Torgasheff, China as a Tea Producer, Shanghai, 1926, p. 218.

[28] Ibid, Appendix I, pp. 237-238.

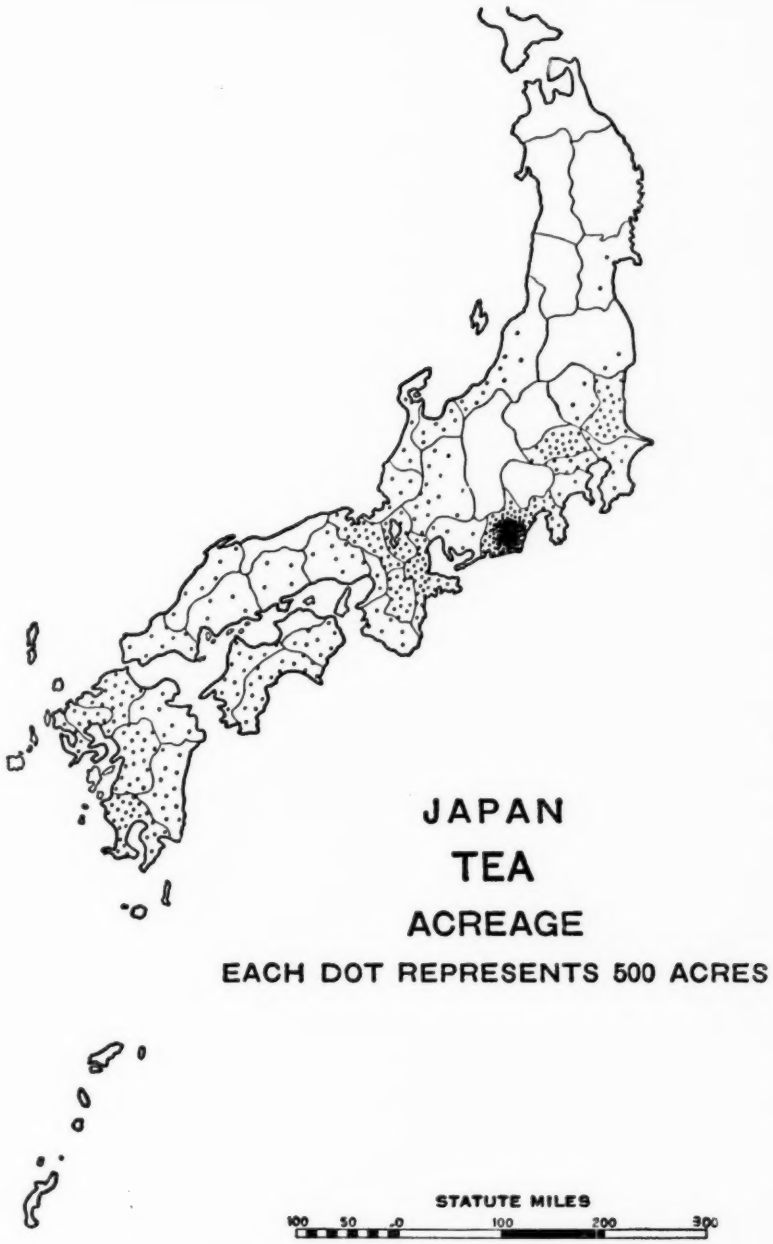

FIG. 3. Note the particular concentration of tea acreage in Shizuoka Prefecture. Courtesy of the United States Department of Agriculture.

stripped of their leaves instead of only the tender first leaves being carefully plucked. There is no premium placed upon careful plucking for everyone's leaf is mixed together at the factory. Pruning and fertilizing are rarely done and many of the tea gardens are choked with weeds. Two-thirds of the whole processing of the leaf is done in the most primitive manner by the villagers before it ever reaches the factory so that the stamp of mediocrity is already upon it. The amazing thing is that China's teas are of as good quality as they are, considering the little attention that is given to their cultivation and manufacture. It is no wonder that China tea is losing ground in tea export in competition with the scientifically grown and prepared teas of South Asia.

No reliable data exist showing tea distribution in China but in general it is an important crop in those provinces bordering the north bank of the Yangtze and from that river southward. The more severe continental climate of North China with its cold winters, short growing season and relatively meager precipitation, make that region unsatisfactory for tea cultivation. Tea is usually a slope crop in China, this being a reflection of crop competition probably more than any other factor, but here as in other countries, tea grown at high elevations is superior to that grown in the lowlands. "For instance in Anhwei Province the most famous black tea is produced on the slope of Li Mountain in Keemun at an altitude of over 3,000 feet. In Kiangsi Province the well-known Hsienya, or "Fairy-Bud" tea, so much liked by Westerners, is produced by the cultivators on Koping Mountains in Foliang 4,000 feet above sea level."[29] Torgasheff is responsible for the statement that the soil occupied by tea gardens in China is almost exclusively red earth.[30] Considering the widespread nature of the tea crop this may be something of an exaggeration but somewhat less emphatic statements from other sources seem to indicate that reddish soils are sought after while the Chinese Department of Agriculture has demonstrated that loams rich in iron are the most typical tea soils.[31] China is outside the tropics and as a result of its shorter growing season, three, or at most four pickings, are all that can be obtained. The first picking which occurs in

[29] William H. Ukers, "A Little Journey to China," in *The Tea and Coffee Trade Journal*, Vol. 49, No. 3, Sept., 1925, pp. 387-420 (p. 414).

[30] Torgasheff, op. cit. p. 70.

[31] Ukers, A Little Journey to China, op. cit. p. 415.

April before the beginning of the spring rains, gives the best tea. The second picking is in May and the leaves at this time are thicker and tougher so that the liquor brewed from them is very strong. The third and fourth pickings of August and September furnish the low grade teas for domestic consumption, neither of these crops being sent overseas.

China produces both green and black tea with the latter normally predominating in export trade in about the ratio of 2 to 1 or even more. Few of the tea growing areas produce both classes for export however. The black teas for shipment abroad come largely from Hunan and Hupeh and to a lesser degree from Anhwei, Kiangsi, and Fukien, while green tea for export originates in Chekiang, Anhwei, Fukien and Kiangsi, with the first two provinces holding premier positions. Hankow on the Yangtze, the chief junction and crossroads of water and rail routes in central China, and surrounded on all sides by a hinterland boasting some of the most famous tea districts in the country, is the greatest tea market. Kiukiang, Shanghai, Hangchow and Foochow likewise rank high in importance as collecting and distributing centers for their respective areas.

Prior to 1918 Russia had become the predominant influence in the China tea trade, Russians not only being the largest importers themselves, but Russian firms established in the main tea markets came to assume control of the tea trade. In one year just prior to the World War Russian firms handled 68 per cent of the tea export from China. Brick tea, made by compressing the dust and the remnants and coarser grades of tea leaf, particularly from the third and fourth pickings, made up a considerable part of the Russian purchases. In 1917, the last year prior to the Russian debacle, brick tea, tablet tea and tea dust accounted for approximately 40 per cent of the total Chinese export. Since 1918 Russia has been a relatively minor factor in the China tea trade, which has been the major cause for a sharp decline in the Chinese exports since that year.

Japan

Like China, Japan grows its tea on small patches of ground, usually one quarter of an acre to an acre in size, rather than on large estates, but unlike China's crop, Japan's is well cared for and scientifically managed. The crop is confined to central and

southern Japan, northern Honshiu and Hokkaido having climates that are too severe for profitable tea cultivation. While tea is grown both on the Pacific and Japan Sea sides of the country, it is much more concentrated on the former, where the summer rainfall is more heavy, snowfall less, sunshine more, winter temperatures somewhat less severe, and the growing season longer. All of the more famous tea areas, including Shizuoka, which now produces nearly one-half of the total crop, are on the Pacific side of Japan.

FIG. 4. A mountain slope in Shizuoka, Japan, well mantled by tea gardens. Note that the tea hedges are planted at right angles to the slope. Tea gives way to rice on the alluvium below.

Normally rainfall exceeds 60 inches thruout the tea-growing districts and in Shizuoka it reaches 80 inches. The growing season varies from about six months on the northern tea frontier to eight in extreme southern Kiushiu. The variety of tea plant grown in Japan (Chinese Indigenous) plus the relatively long, cool season during which it is dormant, preclude more than four pickings at most while three are recommended .

Tea in Nippon is a crop of the mountain foothills and the terrace uplands. The Japanese islands consist for the most part of mountainous cores (nearly 75 per cent is mountain) whose perimeters are fringed with terrace remnants of uplifted ancient deltas

and alluvial fans, and by larger, but still discontinuous areas of recent alluvium. The latter are devoted in a semi-exclusive way to the national food crop, rice, so that the unirrigated crops, including tea, are forced to accept sites on the terrace lands and the mountain slopes. The latter provide the requisite drainage conditions, but at the same time the soils are thin and subject to wash so that the supply of plant food is meager and there is danger of injury to the bush in dry seasons. Tea is sometimes planted on slopes of 20° to 30° in Japan and on such sites it is an ideal crop, for the closely planted hedges at right angles to the slope tend to break the force of the falling rain and to minimize the danger of soil erosion. The terrace lands come nearer to providing the optimum conditions however, for their porous subsoils, usually of sand and gravel, assure perfect drainage conditions even tho the terrace top may be relatively flat, and they also permit the maximum development of the plant's tap root which gives greater insurance against injury from drought and results in larger bushes with greater yields of leaves.

The tea industry of Japan is in none too prosperous condition at present, both the area planted to tea and the export of the leaf having declined during the past decade. Total production in 1925 was 84,300,000[32] pounds of which about 25,000,000 pounds went overseas. In 1912, a pre-war year, the export was 35,500,000 pounds, while the peak was reached in 1917 when 42,300,000 pounds were sent abroad.[33] The falling off in exports is largely due to a waning green-tea market in the United States which normally takes 80 per cent of Japan's tea shipments. Increasingly severe competition for the American market from the black teas of tropical India, Ceylon and Java, where costs of production are less because of cheaper labor and larger yields, has been largely responsible for the declining Japanese sales.

The most famous of Japan's tea areas is the Uji district not far from the old Imperial city of Kyoto, which has for centuries produced the most delicious and highly prized of all Japanese teas. They are special grades however almost entirely for domestic consumption. "Gyokuro" tea ("lustrous dew") is made from fresh Uji buds grown with great care under the shade of straw

[32] Statistical Abstract of The Ministry of Agriculture and Forestry, Section of Statistics, Ministry of Agriculture and Forestry, Japan, Tokyo, 1926, Table 16. p. 19.

[33] "Export of Japan Tea," published by Shizuoka-Ken Tea Refirers Guild, May 24, 1928.

mats so as to preserve the natural green color and unique fragrance. It sells for as much as $3.50 a pound. The Ise district in Miye Ken, Saitama north of Tokyo, and the Kagoshima district in southern Kiushiu, all have fame as tea centers, but Shizuoka, which grows approximately one-half of the country's total crop and supplies nearly the entire export, so far overshadows all other districts that it seems to warrant some special consideration.

Shizuoka Prefecture, Japan[34]

The remarkable concentration of tea gardens in Shizuoka Prefecture is not clearly related to any one particular and striking

FIG. 5. Large uninterrupted areas of tea plantations are characteristic of the flat upland surface of Makinohara. Note the indistinct irregular profile of the mountains in the background.

element of the environmental complex, altho the whole is, to be sure, at least attractive. The favorable combination seems to be a relatively large amount of ash-covered terrace upland in a region of exceptionally heavy warm-season precipitation, the total for the year amounting to about 80 inches. Tea grows on the

[34] For a detailed discussion of the geography of Shizuoka Prefecture, see Glenn T. Trewartha, "A Geographic Study in Shizuoka Prefecture, Japan," in *Annals of The Association of American Geographers*, Vol. 18, No. 3, Sept., 1928.

steep thin-soiled slopes of the sedimentary-rock mountains as well, but it is on the less steeply inclined and more heavily soil mantled lower slopes of Fuji and Ashitaka volcanoes and the still milder slopes of Kuno and Makinohara, both of them terrace remnants, that the greatest concentration of tea gardens is noted. These with their even crests stand out boldly above the adjacent alluvial fans, rising by steep and often precipitous slopes to elevations of 300 to 900 feet. The soils are ruddy in color, high in iron and humus and frequently contain a considerable admixture of gravels with the ash. It needs to be stressed that the ash mantle is an exceedingly important item in the utilization of the Shizuoka terraces, for the author has seen similar uplands in other parts of Japan where the ash veneer is absent, the water-laid sands and gravels forming the surface soil, and there agricultural development is very meager.

FIG. 6. A soil and subsoil profile in the tea lands on Makinohara. The top soils are ruddy colored ash loams with some gravel. The subsoils are poorly assorted sands and gravels.

Mikatagahara terrace bears on its upland surface the largest area of continuous tea gardens to be seen anywhere in Japan. The crest is flat to gently undulating, but in spite of its mild slope there is no problem of drainage because of the porous subsoils. From some points of vantage one can allow his eye to travel off over scores of acres of smooth rounded tea hedges, with scarcely a single variation in culture. The unusual, for in Japan tea gardens are normally intermingled with plots of other unirrigated crops, such as vegetables, grains, and mulberry. It is usually possible to detect the boundaries of the individual rows within the adjacent fields. This promiscuous arrangement of the hedges is in contrast to the methods followed on steep slopes where contour planting is

a necessity. Large villages are lacking on the upland but there are some scattered houses along the highways which follow the flat-topped crests. The lack of villages on most of the terraces reflects no doubt their relative inaccessibility, for the approach to them from the plains is by means of difficult grades.

Shizuoka City, the capital of the prefecture, has become the center for tea manufacturing and exporting in Japan. This situation reflects the advantages which accrue to the business from being in close proximity to the regions of raw leaf production. Over 90 per cent of the tea for shipment abroad is blended and packed by tea exporting houses, largely American owned, located in Shizuoka City. Ninety-four per cent of Japan's total export of tea in 1926 was embarked at the port of Shimizu not more than 8 or 10 miles distant from Shizuoka City. American, Canadian, and Japanese trans-Pacific boats, about 100 in all, make Shimizu a port of call during the summer months in order to obtain this seasonal cargo. The harbor is not sufficiently deep nor the dock facilities adequately developed to permit steamers to approach the wharves, so that transfer of freight is done entirely by lighters. Nearly 99 per cent of the export in 1926 was to North America, United States and Canada importing in the ratio of about 11 to 2.[35]

Formosa (Taiwan)

The tea gardens of Formosa are concentrated on the terraced mountain slopes of the Tamsui Basin in the northern part of the island. Here rainfall averages nearly 80 inches and the winter temperatures are nearly 20° higher than in the tea districts of Japan. Mr. Ukers gives the following description of a portion of the tea district: "What might have been a monotonous ride was relieved by ravishing views of hills and valleys of unusual appeal, wild coasting thru untouched jungles, sudden breaks in the scenic route marked by miles of cultivated hillsides with tea bushes growing in tier after tier and looking like green knobs stuck in the dirt terraces; . . . ."[36] Small tea gardens are the rule in Formosa altho recently Mitsui capital from Japan has entered into the tea growing business on a large scale with the development of large estates. Oolong tea, a semi-fermented product, whose market

[35] Data furnished by the Shizuoka-Ken Tea Refirers Guild, Shizuoka, Japan.

[36] William H. Ukers, "A Trip to Formosa the Beautiful" in *The Tea and Coffee Trade Journal*, Vol. 47, No. 4, Oct., 1924, pp. 565-578 (574).

is almost exclusively in the United States, makes up nearly two-thirds of the entire tea export of the island, with pouchong, a scented variety, whose sale is confined to the markets of the Far East, completing the other one-third.

GEOGRAPHY IN HIGH SCHOOLS

CLARE SYMONDS

Senior High School, Quincy, Illinois

This investigation was inspired by a few lines in an article published in the *Journal of Geography,* May, 1927—"The Contribution of Geography in Senior High Schools" by A. P. Brigham. "Geography is doing well in the grades and higher schools and is doing nothing or next to nothing in most secondary schools." Such a challenge could not be overlooked and as a result a group of pupils in the Geography Department of Quincy Senior High School became interested in a survey to determine, if possible, whether facts of the present day would prove or disprove such a statement.

NATURE AND SCOPE OF THE SURVEY

A questionnaire was formulated covering such general topics as: (1) courses offered, (2) length of courses, (3) year offered, (4) method, and (5) texts used.

The larger cities in each state were selected for the survey in the hope of reaching most of the senior high school organizations in this way. However, some of the questionnaires returned indicated "Freshman" or "Ninth" year as the year in which geography courses were offered in that city. Since this survey was intended to cover only senior high school geography courses, the offerings in the ninth year were disregarded in tabulating the information for the report published in May, 1928.*

*We will be glad to receive information from any senior high school organization which was overlooked in the original survey. We expect to continue the investigation and include additional items as: percentage of senior high school pupils taking geography, the scope and contents of the courses offered, the aims, etc. The co-operation of all senior high schools will be appreciated. We have a few copies of the printed report of the investigation which we will be glad to send to anyone who did not receive one.

One hundred copies of the questionnaire were circulated in May, 1927. From this group 67 per cent of the questionnaires were returned. In September and October, 1927, 304 questionnaires were sent; the percentage of returns from this group was 74.3. It is evident that if all the questionnaires had been circulated in September and October the total percentage of returns would have been higher. The average percentage of replies from the 404 representative cities to which the questionnaires were sent was 72.5.

COURSES OFFERED

	No. of cities
Physical	66
Commercial	175
Other courses	13
More than one course	55
No courses in Senior High School	92

Of the 289 cities replying, 197 (68.17 per cent) offer some geography course in their senior high school, while 92 (31.83 per cent) have no courses. Since fifty-five cities (19 per cent) offer more than one geography course, the total number of courses offered is 254; sixty-six physical, 175 commercial, thirteen miscellaneous. The miscellaneous courses are: astronomy, geology, high school geography, history of commerce and industry, human ecology, human geography, international business relationship, industrial geography, normal training course for teachers, and social geography.

LENGTH OF COURSES

	One semester	*Two semesters*	*Three semesters*
Physical	32	34	0
Commercial	112	62	1
Other Courses	11	2	0
	155	98	1

It is interesting to note that of the 254 geography courses offered, ninety-eight are two semesters in length and one school offers three semesters of commercial geography. Twenty-three cities offer three semesters of geography and eight cities offer four semesters of geography.

YEAR TAUGHT

	Any	*Sophomore*	*Junior*	*Senior*
Physical	8	30	22	6
Commercial	10	107	47	11
Other Courses	2	3	1	7
	20	140	70	24

The tenth year seems to be the most popular for geography courses, at least for commercial geography, the eleventh year being a close second for physical geography, the twelfth year ranking first for other geography courses. The latter may be true because of the nature of the other courses, the most of which would seem best fitted to be senior courses.

METHOD

The information given showed such marked uniformity in methods of presenting physical geography that to mention "recitation, laboratory, and field trips" covers the majority of cases. Other methods named are: semi-laboratory, demonstration and discussion, textbook, daily question with test every two or three weeks, question and answer, no laboratory, and recitation and lecture.

That lack of uniformity seems to characterize the methods used in presenting commercial geography is evidenced by the following quotations:

Visits to local industries by class; visits by individual students and reports to class; making of exhibits; reports on articles read; note books or files; clippings; maps; visits.

Study of complete text generously supplemented with current matter. Application to Pacific Southwest emphasized.

Combination of lecture, discussion and laboratory methods.

Regular high school classes.

Largely outlined—textbook.

Supervised study.

Five recitations per week.

Class discussion and investigation.

Laboratory—along line of the Dalton Plan.

Question and answer.

TEXTS USED

Information in regard to texts used in geography courses covers almost if not quite all of the published texts on physical and commercial geography for the high school. The tabulated

list contains twenty-five different texts, three of which are used as the text for both physical and commercial geography classes. The number of cities using these texts varies from one to seventy-six.

In the following list each text is represented by a letter.

PHYSICAL GEOGRAHY

A is used in 16 cities
B is used in 9 cities
C* and D (each) are used in 8 cities
E is used in 7 cities
F is used in 5 cities
G* is used in 2 cities
H, I, J*, K (each) are used in 1 city

COMMERCIAL GEOGRAPHY

L is used in 76 cities
M is used in 55 cities
N is used in 16 cities
O is used in 13 cities
P is used in 3 cities
Q, R, S (each) are used in 2 cities
T, U, V, W, X, Y (each) are used in 1 city

* C is used as Commercial Geography text in 7 cities; G and J (each), 2.

COMMENTS IN REGARD TO COURSES

Perhaps the most significant contributions to the survey are the comments which some thoughtful persons added to their questionnaires. We are sorry that more of those who filled out questionnaires did not add some remarks.

THOUGHT PROVOKING

Until this year, we had courses in economic history of the United States and commercial geography, one-half year each in the tenth grade.

Commercial geography was taught for a while in the High School of Commerce, but we could find no correct definition of the subject and so general science was put in its place.

We have offered commercial geography as an elective in sophomore year but haven't had a class in five years on account of interest.

We have no geography in our school. We have the equipment but no election.

Geography taught in the grades.

DISCOURAGING

Geography has been discontinued.

We expect to discontinue the course in physical geography.

ENCOURAGING

No course at present. Have had both physical and commercial and think will start them again.

We are working over the course in commercial geography setting more definite objectives and laying a little more stress on the vocations and industries of our state.

IN SUPPORT OF THE PRINCIPLE UPON WHICH OUR GEOGRAPHY COURSE IS BASED

(Study of the elements of natural environment, including types, characteristics, distribution on the earth and influence exerted, *must precede* a study of commerce and industry if the pupil is to understand the causes for the regional differences in economic life.)

A brief course in physical geography as a background for the economic development.

Some stress on physical in the commercial geography course.

The teacher feels that the subject of physical geography must be emphasized more than the text used emphasizes it so uses supplementary material of all kinds.

Physical geography not taught except as an introduction to commercial geography.

Physical geography is given as a basis for the commercial and economic geography course.

IN CONCLUSION

We believe that the information thus gathered reveals certain tendencies of great significance to those interested in promoting the study of geography in senior high schools. When 72.5 per cent of four hundred representative cities of the United States respond so readily and so thoughtfully to such an investigation, we must agree that interest in the subject is at the point where a little stimulus will secure for geography a larger place in our high schools. Such a high degree of interest certainly assures thoughtful consideration of the value of a geographic education that has no "hiatus" in our senior high schools.

AN EXPERIMENT WITH THE CONTRACT METHOD IN HIGH SCHOOL COMMERCIAL GEOGRAPHY

H. O. LATHROP

State Teachers College, Whitewater, Wisconsin

The school as an institution is an organized effort of society to pass on to succeeding generations the experiences and ideals that have been found valuable to the race. In the transmission of these experiences and ideals the school aims to develop the mind of the child so that he may use his knowledge of racial experiences intelligently and advantageously. It is also hoped that he may be inspired to use his intellect in such a way that he will add something to the sum total of the world's worthwhile knowledge. The teacher is society's agent for the passing on of racial experiences. It is the teacher's objective to convey this information and to develop skills, attitudes, and appreciations in

the child as rapidly and efficiently as possible. The more efficiently this is done the fewer years of the child's life are required for preparation. Here is the crux of the teacher's problem. Youth does not always see the value of certain information, skills, attitudes, appreciations, and participations. Thus the child wastes his time. There has ever been, and probably always will be, a constant struggle for the teacher to get pupils to want to know what the teacher as a representative of society thinks they ought to know. Around this problem have developed most of the methods of teaching.

Problems of arousing interest, motivation, tests, marks, competition games, honors, and what not, are all devices to get the pupil to desire to know or do something society thinks he should know or do. These efforts on the part of teachers and educational leaders have led to the development of a number of newer approaches to the problems of classroom procedure. Some of these are similar or have elements of similarity. Those more prominently known are, "The Case Method," "The Dalton Plan," "The Unit Plan," "The Winnetka Plan," and "The Contract Method." All of these newer methods aim at greater economy in the learning process and higher efficiency in classroom procedure. The purpose of this discussion is to describe one way of using the Contract Method, and to evaluate some of the advantages and disadvantages of the plan.

The Contract Method is supposed to remedy what we all recognize to be one of the chief defects in teaching, namely, that of trying to make a pupil learn when the teacher is ready for him to learn, instead of permitting him to learn when he is ready to do it himself. This situation is a natural and perhaps inevitable result of group instruction. Since group instruction is necessary if education is to reach the masses, it is worth while to find a remedy for such a situation if possible. The Contract Method, simply stated, is to give a child a definite task to do and to permit him to do it when he wants to, within certain set limits, the teacher aiding when the pupil needs help.

Such a method assumes certain things: (1) That the pupil understands clearly what is to be done and accepts the responsibility for doing it. (2) That the unit of work is definite and well organized. (3) That there is a well written body of literature on the unit. (4) That such literature is within the reach and

comprehension of the child. (5) That duplicating apparatus, such as mimeographs and other duplicating machines, are at the disposal of the teacher. (6) That the teacher has time for the extra work involved. (7) And, finally, that the teacher has analyzed the situation carefully and knows what he is doing.

The following Contract is one of a series used in a Commercial Geography class in the high school of the State Teachers College at Whitewater, Wisconsin. There is one departure in procedure from that used generally. The pupils were not asked to write out a large amount of material but mastery of subject matter and grades were determined by objective tests. The purpose of this change was two-fold, namely, to save time for both the pupil and the teacher. Mimeograph copies of the Contract were placed in the hands of the pupils and at the completion of the study the accompanying test was given. This Contract is developed on the three-level basis.

CONTRACT: PETROLEUM AND NATURAL GAS

Commercial Geography, Tenth Grade
Time, 2 to 3 Days

"Petroleum resources have now become the most important measure of a nation's strength. There was a time when territory was the principal object of competition among nations. Wars were fought for it. Today the greatest, the most acute competition among nations centers around oil.

"All our means of transportation and communication, our trains, steamers, motor cars, aëroplanes; all the machinery that has made possible large-scale production and the consequent saving of human effort and increase of the world's wealth; all labor-saving devices in the home—all the things that have added so much to life's comfort and pleasure during the past few decades would not have come if it had not been for oil."[1]

From the above quotation it is clear that petroleum is an important commodity to much of the world. Why is petroleum so important to the world today? How abundant a supply has the United States? How are we prepared to meet the competition of foreign nations? What are we doing to secure our share of the world's reserve of petroleum? These are problems and questions that concern all of us. If you work carefully thru this Contract, you should be able to answer them intelligently.

[1] Leo Pasvolsky, Civilization and Oil. *Atlantic Mo.*, vol. 131:167.

I. General References

1. Whitbeck, R. H., Industrial Geography: 168-177
2. Smith, J. Russell, Commerce and Industry, Revised: 214-244
3. Chamberlain, J. F., Geography—Physical, Economic and Regional: 320-325
4. Ridgley, D. C., Economic Geography Notebook: 62-63

II. Introduction

1. This has been called the "age of petroleum." What justification is there for this designation? Is it true?
2. Write a list of as many uses as you can of petroleum and petroleum products. Smith: 214, and Whitbeck: 171-172. For which of the uses can you suggest a substitute? Write the name of the substitute after the name of the product. For what ones can you find no substitute? Hand these two lists in at the first recitation period in the study of this Contract. It is estimated that the supply of petroleum in the United States will last but ten or fifteen years. What shall we do for these products then?
3. How does petroleum occur in the earth? Is more forming so as to affect the dearth that appears to be approaching? Read Whitbeck: 168, and Smith: 216. How is petroleum obtained? Give a full description of how an oil well is drilled. Smith, Figure 135. How is the oil stored? Figure 100 in Whitbeck and 134 in Smith. Why are earth reservoirs used at times instead of tanks?

III. The Petroleum Industry of the United States

1. What are the seven oil fields of the United States as shown on Figure 101 in Whitbeck and page 63 of your notebook? Write the names of the various fields on the map on page 63 of your Notebook. Read pages 169-171 in Whitbeck, and 216 and 217 in Smith.
2. Which of these fields is the oldest? See Figure 133, Smith. Which one is the largest producer now? See Notebook: 63 and Chamberlain: 322 and 323, and Figure 133 in Smith. Has the production of these fields

changed materially since these books were written? Which of the fields are nearly exhausted? Find the latest statistics possible in such publications as the United States Geological Survey reports and the World Almanac. From the graf, Figure 133 in Smith, make a statement that is applicable to the history of production in all fields. What does this mean ultimately for the petroleum supply of the United States?

3. Name the three chief ways by which petroleum is transported in the United States. Read pages 172-174 in Whitbeck, and 219-220 in Smith. See Figures 102 and 103 in Whitbeck. Which method is most important? Why? Why are different methods used for transporting petroleum than are used for transporting coal? What influence does the method of transportation have on the price of petroleum and its products. Why is much of the petroleum transported to refineries near New York and Chicago before it is refined? How does Figure 138 in Chamberlain show a great loss in the oil industry? How can this loss be prevented?
4. How is petroleum refined? See Smith, pages 223-224. How many different products are obtained? Write a list of as many as you can. Which of these products have been increasing in importance? What has been done to obtain greater quantities of some products? What of the future?
5. What is the relation of natural gas to petroleum? How is it produced? In which fields is gas production important? Why has much of it been wasted? How is it formed? What future possibilities of use has it?

IV. Petroleum in the Rest of the World

1. What are the important producing countries besides the United States? Notebook: 63, Chamberlain: 323. Write the names of the countries in the appropriate location on the map, page 63 of your Notebook. What change in production has occurred since these books were published? See Whitbeck, Figure 105. Can you find later statistics? What trouble has occurred in the Mexican fields in recent years? How is this imoprtant to us?

Where is new production developing not shown in the books? What proportion of the world's production of petroleum is supplied by the United States? Will this situation continue in the future?

2. To what countries does the United States send petroleum products? See Smith: 224 and Whitbeck: 174. How is it exported? From what countries do we import? Are imports or exports greater? What will be the situation in the future?
3. Answer the questions at the end of the chapter in Smith and in Whitbeck.

V. Place Location

Locate on the map, page 63 of your Notebook, the following places which are important in the petroleum industry. Write opposite each what it is important for in the petroleum industry. Baku, Tampico, California, Tulsa, Galveston, Whiting, Caspian Sea, Persian Gulf, Mesopotamia, Borneo, Sumatra, Port Arthur, Burma, Pennsylvania, Maracaibo, New Jersey.

"B" Level

If you have mastered satisfactorily the "C" level Contract, read the article in Compton's Pictured Encyclopedia Vol. 7: 2749-2755. If you master this satisfactorily you will receive a "B".

1. What were some of the early uses of petroleum as given on page 2749? Describe the first oil boom and note how it changed the use of petroleum.
2. From a study of the pictures on pages 2749, 2750, 2751, and 2753 describe how petroleum is produced.
3. Study carefully the picture on page 2751 and draw a diagram and hand in, showing how oil occurs in the earth. Indicate where a "dry hole" might be drilled.
4. From the map on page 2752 write a list of the countries having large petroleum reserves. List them in the order of magnitude of the reserve in so far as possible. How does the United States rank? Compare with page 220 in Smith. Hand the list in.
5. Where is the "world-wide struggle for oil" taking place? Page 2755. Why is it regarded as a serious struggle?

"A" Level

If you have completed the "B" and "C" levels read one or more of the following magazine articles and hand in an outline of each and be prepared to give a five to ten minute report in class. A maximum of twenty points credit will be given for this work. The number of points of credit for satisfactory work is indicated after each reference.

1. Mitchell, G. E., Billions of Barrels of Oil Locked up in Rocks. *National Geographic*, Vol. 33:195-205 (10 points)
2. Bonsal, S., The Nation's Oil Reserves. *Rev. of Rev.*, Vol. 69:268-276 (5 points)
3. Smith, G. O., Where the World Gets Its Oil; But Where Will Our Children Get It? *National Geographic*, Vol. 37:181-202 (15 points)
4. Lee, Thomas, The Race for Oil in Venezuela. *World's Work*, Vol. 51:148-161 (10 points)
5. Shooting Oil Wells As a Fine Art. *Literary Digest*, Vol. 88, March 27, 1926: 21-22 (5 points)
6. Welliver, J. C., Oil: The New Industrial Giant. *Review of Reviews*, Vol. 74: 177-186.

VI. Examination

The examination will be in two parts corresponding to the "C" and "B" levels. You will write only on the part you have mastered. Your standing on the "A" level will be determined by the outlines handed in and reports given in class.

TEST ON PETROLEUM AND NATURAL GAS

"C" Level

True-False

Place a "T" before the statement, if it is true, and an "F" if false.

(..) 1. The average daily production of American oil wells is less than five barrels a day per well.
(..) 2. The first petroleum discovered in the United States was found in southern California.
(..) 3. In 1927 the United States produced nearly two-thirds of the world's total production of petroleum.
(..) 4. At the present rate of consumption the United States has enough petroleum to last many generations.
5. So important is petroleum that the great nations of the world are making strenuous efforts to get control of new fields.
(..) 6. Petroleum is generally found with natural gas.
(..) 7. It is easy to confine and store natural gas and thus prevent it being wasted.
(..) 8. Our exports of petroleum products are small.
(..) 9. The Appalachian Field has produced oil for over 75 years.
(..) 10. The productive oil fields that once existed between the Caspian Sea and the the Persian Gulf are exhausted.
(..) 11. The first important use of petroleum was for lighting.
(..) 12. Where easily available, natural gas is the cheapest and most convenient of all sources of power.
(..) 13. The problem of oil conservation is important.
(..) 14. The yearly value of natural gas produced in the United States is more than that of all the gold and silver produced annually in this country.

15. Large quantities of oil come from the region along the Gulf coast of Mexico.
(..) 16. Because of its heavy domestic consumption the United States imports large quantities of petroleum.
(..) 17. Petroleum has had little effect in spreading civilization over the world.
(..) 18. The largest production of petroleum in the United States is in the Ohio-Indiana field.
(..) 19. The chief oil fields of California are in the southern part of the Valley of California.
20. The United States produces more petroleum than all other countries combined.
(..) 21. The future of the petroleum industry is uncertain.
(..) 22. The only source of petroleum products is from oil wells.
(..) 23. Benzol is a product of petroleum.
(..) 24. The Diesel engine is an aid in the conservation of petroleum.
(..) 25. The United States exports but small quantities of refined petroleum products.
(..) 26. The petroleum of the United States is better for illuminating purposes than that of Russia.
(..) 27. Crude oil is not used for raising steam in boilers.
(..) 28. The United States is the chief producer of natural gas.

Recall

Write the answers to the following in the space between the questions.

29-35. Name the seven oil fields of the United States.
36-38. Give the three chief methods of transporting petroleum.
39-40. What two factors are responsible for America's prominence in oil production?
41-44. Give four large refining centers in the United States.
45-46. What are the two leading oil fields in the United States at present?
47-51. What are five important petroleum producing countries?
52-59. Each of the following is important in the petroleum industry. Locate and tell for what each is important.

	Location	Importance
Whiting		
Tampico		
Maracaibo		
Tulsa		

Note: No space is left between questions in the test as here printed.

Multiple Choice

Place the figure indicating the correct fact in the blank at the left.

60. ..... (1) Pennsylvania, (2) Illinois, (3) Oklahoma, (4) Kansas produces the most oil.
61. ..... Oil is extensively used as locomotive fuel in (1) Central, (2) Eastern, (3) Western United States.
62. ..... (1) California, (2) Oklahoma, (3) Texas, (4) Pennsylvania was the first producer of petroleum in the United States.
63. ..... The largest percentage of petroleum is used for (1) kerosene, (2) fuel oil, (3) gasoline.
64. ..... (1) Burma, (2) Port Arthur, (3) Baku, (4) Tampico is the center of the oil industry in the Caspian Sea district.
65. ..... Natural gas is used for (1) automobiles, (2) domestic fuel, (3) locomotives.

"B" Level

Do not write on this part of the test unless you have mastered the "B" LEVEL CONTRACT.

True-False

Place a "T" before the statement, if it is true, and an "F" if false.

(..) 1. Rock oil is synonymous with petroleum.

(..) 2. "Coal oil" was obtained from petroleum.
(..) 3. Chemically, petroleum is a simple substance.
(..) 4. A gusher has to be pumped.
(..) 5. Petroleum is found in sedimentary rocks.
(..) 6. Oil deposits can be determined by surface conditions.
(..) 7. Petroleum is generally found in anticlines.
(..) 8. Oil wells are drilled beneath the ocean along the coast of California.
(..) 9. The United States imports large quantities of petroleum from Mexico.
(..) 10. The Standard Oil Company rose to power thru the control of refining and transportation facilities.
(..) 11. Larger quantities of gasoline are obtained by the "cracking" process.
(..) 12. The geologist is of great assistance in locating oil reserves.

Recall

Write the answers in the space between the questions.
13. What is the probable origin of petroleum reserves?
14-18. Name five countries having large petroleum reserves.
19-20. What are the two chief types of crude petroleum, based upon chemical constituents?

Summary and Conclusion

The following summary will emphasize the aims of Contract work, methods of using it, and the advantages and disadvantages as they have been revealed in our experience with the method in geography classes at Whitewater. The statements given are to be regarded as tentative and in no sense final or conclusive. Further use and experimentation may make it possible to overcome several of the disadvantages listed. The experiment was carried on for parts of two years in a school system where most of the work is not done by Contracts but in which numerous similiar experiments are being carried on in other departments. The results stated here are those that stand out after a brief experience in which everything possible was done to make the method a success.

I. Aims of teaching by Contract
   1. To enable the pupil to work when he desires to do it.
   2. To permit the pupil to work at his own pace.
   3. To give extra work for the bright pupil.
   4. To emphasize a unit of work instead of one day's assignment of certain pages in the textbook.
   5. To require mastery by all pupils of essentials as outlined in the "C" Level of the Contract.

II. Steps and Methods of using the Contract
   1. Preliminary discussion and motivation. Informal discussion to find what the pupil knew about the unit and to interest him in further study of it. This corresponds to the "Exploration" step in the "Morrison Plan."

2. Supervised study. The time of the first day or days (depending upon the length of the Contract) was spent largely in working with the pupils and showing them how to study and where to find the information required.
3. Study hour. In addition to supervised study during the recitation hour the pupils were expected to give a minimum of a fifty-minute class hour to individual study and preparation. Such preparation could be made in the study hall, library, or class room. This need not be one period each day, but may all be done at one session of several hours if the pupil prefers it.
4. Discussion of class problems. The first part of each class period was given over to discussion of those points which had given difficulty to a majority of the pupils.
5. Handing in written work. Certain parts of the Contract require written work. The pupils were informed when this was due and it was handed in at that time.
6. Recitation. The last day prior to the examination, most of the recitation period was taken up with class discussions and drill work.

III. Values from the use of the Contract Method

1. All pupils master the minimum essentials.
2. Chance for "bluffing" is lessened.
3. Responsibility for learning is put up to the pupil where it belongs. The task is literally up to him.
4. It secures more careful preparation.
5. It gives opportunity for the pupil to work according to his ability, time, and interests. This is especially valuable for the bright and dull pupils.
6. It enables the pupil to work when he wants to rather than when the teacher wants him to work.
7. Some of the pupils said they learned more than by other methods. This was particularly true of the brighter pupils.

IV. Disadvantages in the use of the Contract method

1. Procrastination. Pupils are disposed to put off work from day to day until an amount of work impossible of mastery and assimilation accumulates near the end of

the Contract period. This was not true of all but of some.

2. Lack of interest. The method deprives the teacher of the advantage of developing interest by full hour class discussions from day to day. Much of the text and other materials used for preparation is not written in an interesting style.
3. Lack of sufficient class discussion to emphasize important points and for drill.
4. Requires more time than some other methods
5. Lack of class unity because all are not doing the same work or are not doing it at the same time.
6. Large amount of the teacher's time necessary to work out the Contracts.

INTEREST-STIMULATING DEVICE

A GEOGRAPHICAL STORY

The geographical story is used as a class exercise upon the completion of the study of the United States. The story, as written, may be placed on the blackboard, or if a duplicating outfit is available, copies may be made for each pupil. The children are permitted to use maps and substitute the names of the correct cities, capes, rivers, etc., for the locations given in parentheses. The result is a complete story. The story is an interesting aid in map work and the children enjoy composing stories of their own after this one has been given to them.

The spring of the year is the time for picnics, so early one morning 1 (a city in Oregon), 2 (a city in Ohio), 3 (a city in Alabama), 4 (a city in Wyoming), 5 (a city in Nebraska), 6 (a city in Minnesota), 7 (a city in Washington), 8 (a city in Maine), 9 (a cape on the coast of Massachusetts), and 10 (a city in Idaho) decided to go to 11 (a city in Wyoming). 12 (A city in Wyoming), dog, 13 (a city in Nevada), accompanied the party.

The children's lunch was prepared by their mothers, but they stopped at the corner grocery and bought some 14 (river in Montana) and then hailed a 15 (city in Oregon) and bought some cookies.

Immediately upon their arrival at 16 (a city in Wyoming) the boys began to play ball. Suddenly 17 (a city in Alabama) exclaimed, "There is a 18 (river on the boundary of Oregon and Idaho)." The girls rushed to a 19 (city in North Carolina). All were filled with 20 (cape on coast

of North Carolina), and 21 (a city in Ohio) exclaimed, "22 (cape on coast of North Carolina) as he hurled a piece of 23 (city in Michigan). His aim was good and the 24 (river on the boundary of Oregon and Idaho) died instantly.

The weather in the afternoon was 25 (river on the boundary of Minnesota), so the children left early for home, declaring they had a 26 (canyon in Arizona) time.

ANSWERS

1. Eugene	8. Augusta	15. Baker	22. Lookout
2. Hamilton	9. Ann	16. Rock Springs	23. Flint
3. Florence	10. Wallace	17. Florence	24. Snake
4. Douglas	11. Rock Springs	18. Snake	25. Rainy
5. Beatrice	12. Douglas	19. High Point	26. Grand
6. Virginia	13. Sparks	20. Fear	
7. Everett	14. Milk	21. Hamilton	

Each number represents some place in the United States. When these places are substituted for the various locations, the geographical story will be complete.

ETHEL M. REESE
Wilson School, Lakewood, Ohio

GEOGRAPHICAL PUBLICATIONS

C. Matheson. **North America.** 255 pp. Oxford University Press, American Branch, New York. 1927. $1.25.

This is an English geography textbook planned for children over twelve years. In American schools, it would be placed in about the sixth or seventh grade. The organization of the subject-matter is logical, i.e., "Position—Extent—Coasts; Surface Features; Climate—Vegetation—Animal Life;" etc. Naturally British North America is considered before the United States.

This book will be useful as a supplementary reader in the upper grades. It is packed full of facts. The factual material has been given the greater amount of space. Tracing of relationships, that is any discussion of the results of geographic conditions, is secondary, in fact, usually barely mentioned. An example of this is in his discussion of the Appalachian Mountains, he sums up their influence on the development of United States—"The mountains, clothed as they were with forests and thick undergrowth, proved a formidable obstacle to the westward movement of the first settlers, but later, roads and railways were constructed by a skillful utilization of the valleys."

Numerous black and white maps and diagrams are well placed for ready reference. The pictures are not numerous but are clear and well selected.

Teachers should be interested in comparing this with our textbooks. They will find much valuable material in this little book for their own use.

ZOE A. THRALLS

University of Pittsburgh

HAPPY NEW YEAR

Would you make the New Year Pleasant and Prosperous if you Could? *You may!* It depends upon you alone. Just note how helpful this number of the *Journal* will be to you. You may have nine such numbers every school year. Next month there will be a fine article on The Coffee Industry of Brazil by Dr. W. H. Haas of Northwestern University, who has studied the industry in the country where coffee is the great industry of the people. *You just can't afford to miss it. We hereby extend to you an invitation to become a member of the National Council of Geography Teachers and secure the Journal at the membership rate of only $2.00 a year.* Note what others say about the *Journal.*

1. "Had they been printed to order, they could not have fitted my work better and since school work is becoming so standardized they must be of the same value in any section. So much of the material is typical and in that way is much more valuable to any teacher, who has ability, than if it were specific. The scope of each number is wide, therefore, each has something of value to teachers in whatever grade they may teach. The material is all so up-to-date and dependable that I hardly see how a teacher would be willing to be without it. I must also mention the front covers which are a source of delight as they are always artistic and unusual."
2. "I find the *Journal* very helpful. I use the back numbers for the articles on the special country I may be teaching. We have the *Journal* in the school library."
3. "I have nothing but praise for the *Journal.* I feel that the articles in it are wonderful and a great help in the teaching profession."
4. "I took the *Journal* a long time after I did not need it which proves that I think it an excellent magazine."
5. "I enjoy the *Journal* very much. It was a splendid help in my geography work."
6. "I think your magazine is an excellent one and will recommend it."
7. "I find the *Journal of Geography* invaluable in my work and am doing all I can to introduce it to the teachers. It seems to improve continually in type and variety of subject matter. I have asked three representative students of my department to give their opinions of it and received the following response:

    1. No teacher can do the best work without it. It keeps up-to-date, gives new ideas and is good authority.
    2. Opinions and ideas of experienced people give assurance in the use of material, puts us in touch with what people are doing elsewhere.
    3. Work is so practical that it may be used as supplementary material in the class-room. Gives a good basis for project work. Is not only an aid in teaching geography, but also correlates with other subjects."

8. "I am now teaching the sixth grade in the ——— School and I find the *Journal* a source of great help to me and my pupils, both the articles on subject matter and the ones on method. I have used several of the articles and am now using the one on 'Geographic Principles in the Study of Cities,' by Douglas C. Ridgley. The articles that have been the most use to me are the long ones, such as 'The House and Geography,' by Frances S. Hay, 'Motivating the Curriculum Thru Geography,' by Olive Nolan, and 'Navigation on the Lower Mississippi,' by C. A. McCombs. I am saving my numbers for future reference."
9. "For ten years I have used the *Journal of Geography* and I feel I cannot get along without it. Every new number is a fresh source of inspiration."
10. "I found the *Journal* the best on the market. It is so fine and advanced it will take all this term to 'try out' and assimilate all the good suggestions."

Act Now! Send your application to the undersigned at once.

GEORGE J. MILLER, Secretary
STATE TEACHERS COLLEGE
MANKATO, MINN.

NEW BOOKS

Statistical Abstract of the United States, 1928. 841 pp. Bureau of Foreign and Domestic Commerce. Supt. of Documents, Washington, D.C. 1928. $1.00.

The latest statistical data on manufacturing and mining industries, agriculture, forests, fisheries, and a number of miscellaneous subjects such as population, education, transportation, commerce, immigration, emigration, government finances, and banking.

Commerce Yearbook, 1928. Vols. I, and II. United States. 708 pp. Bureau of Foreign and Domestic Commerce. Supt. of Documents, Washington, D.C. 1928. $1.00 and $1.25.

Commencing with this issue the yearbook is designated by the year in which it is published, not by the year under survey. Thus this is a survey of conditions in 1927, and covers such topics as domestic and foreign trade, agricultural products and foodstuffs, fuel and power, construction materials, machinery, metals, automotive and rubber products, textiles, leather, paper, chemicals, finance, and communication. Vol. I covers the United States and Vol. II foreign countries.

James E. Parks. **Luxemburg.** Trade Information Bulletin No. 559. 13 pp. Supt. of Documents, Washington, D.C. 1928. 10 cents.

A brief economic survey. The Grand Duchy voted in 1919 in favor of an economic union with France. France declined the proposal in favor of Belgium. The largest and most valuable industries are those associated with iron and steel production.

Appleton's Modern School Atlas. Edited by George Philip and W. R. McConnell. 96 pp., and a 58 pp. index. D. Appleton & Co., N.Y. 1928.

By featuring physical, political, and economic conditions, comparative studies of geographical causes and effects may be made. The physical features receive the major emphasis. All the sectional maps of the United States are on the scale of one inch to 80 miles, all other general maps being on the same scale or on one bearing a simple ratio to it.

Port Series No. 18. The Ports of Southern New England. 342 pp., 28 illustrations. 85 cents. **Port Series No. 22. The Panama Canal and its Ports.** 72 pp., 24 illustrations. 35 cents. Government Printing Office, Washington.

These are the last of a series of 22 reports on the principal ports of the United States. Eventually a complete series of world port studies will be made. Reference to the other numbers on United States ports have been made in past numbers of the *Journal*. The reports will be revised at reasonable intervals to keep them up to date. Thus far only one has been revised, No. 1, which relates to Portland, Me.

Laboratory Exercises in Physiography and Geology. 29 pp. Prepared by members of the Department of Geology and Geography, Northwestern University. Fifth Edition. 1928.

Most of the exercises are based on topographic maps.

Southworth and Kramer. **Great Cities of the United States.** 309 pp. Illustrated. Iroquois Publishing Co., Syracuse, N.Y. 1928.

Historical, descriptive, commercial, industrial. The story of 13 cities is linked with the development of various sections of our country. At the end of each chapter is given a list of facts to remember and some questions for review.

Elizabeth K. Van Deusen. **Picturesque Porto Rico.** 291 pp. Illustrated. Silver, Burdett & Co., Newark, N.J.

Stories and poems reflecting the life of the island in various settings. The book has been adopted for use in the English classes of the Porto Rican public schools.

MAP OF THE ANTARCTIC

In Two Colors

COMPILED FROM ORIGINAL SOURCES AND PUBLISHED BY

THE AMERICAN GEOGRAPHICAL SOCIETY

BROADWAY AT 156TH STREET - NEW YORK

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